Citizen Science to the Rescue

Vieques

A real need for citizen science

THE VIEQUES CONSERVATION AND HISTORICAL TRUST

FIDEICOMISO DE CONSERVACIÓN E HISTORIA DE VIEQUES

- A non profit 501 (c) (3) that has been working for the Island of Vieques for over 30 years.
- A particular priority of the VCHT's mission is the conservation of the natural and cultural resources with special emphasis Puerto Mosquito Bioluminescent bay nature reserve.
- Led by Lirio Marquez D'Acunti

  Executive Director

Vieques

- Its an island
- Approximately 10,000 people
- Incredible natural resources
- Strong cultural roots
- A complex set of varying circumstances throughout it's history
- Blend of cultures and people
- Large Agricultural projects
- Military base with bombing range for 60 years
- Tourism boom
- Currently in a flux state in terms of development, growth and a key moment in the determination of Island's future

The Trust

Has

- Museum
- Aquarium
- Manta Educational Program
- Scholarship program
- Laboratory and research
- Community Service and visitor center
- Partners in sustainability for Vieques
- Bioluminescent bay education and collaborations

Triple win-Alliances

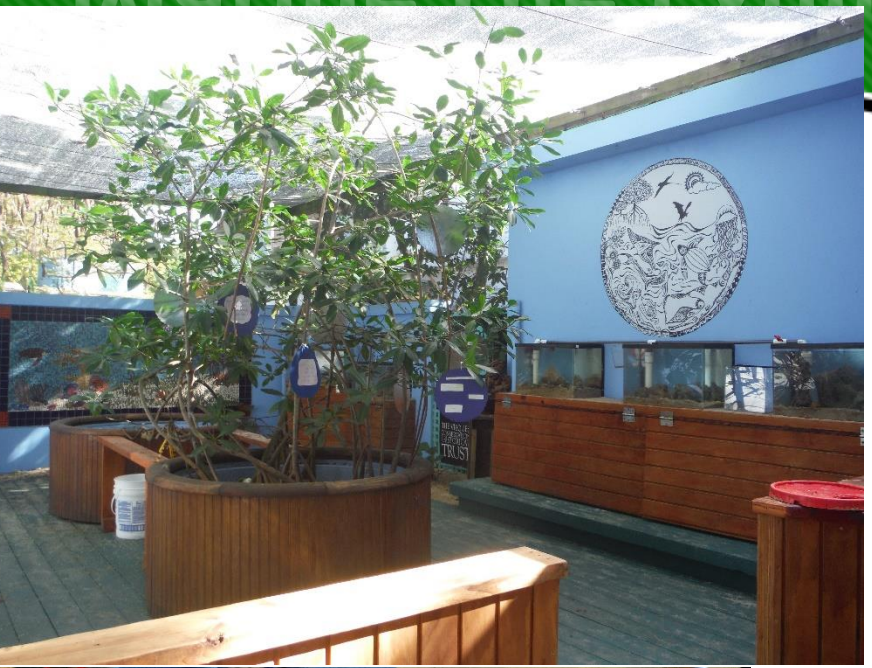
- EPA
- DNER
- EQB
- University of Puerto Rico
- PR Conservation Trust
- Sea Grant
- USFWS
- NOAA
- Government
- ENGDE
- Other NGO's
- University of Southern Maine
- Scripps Institution of Oceanography
- Community
- Schools

A collaboration of these agencies and the people allowed us to create and implement a wide variety of programs and initiatives in response

The community as our workforce

- A small staff and:

Marine Life Exhibits



Use who you have, what you have, what you do and keep it as simple as complex can be

Schools and youth education

- **The PR Department of Education**

Has problems.

Vieques

Strikes to bring attention to lack of teachers and resources

2010 no chemistry, physics teachers in only high school

No science Fair for 5 years

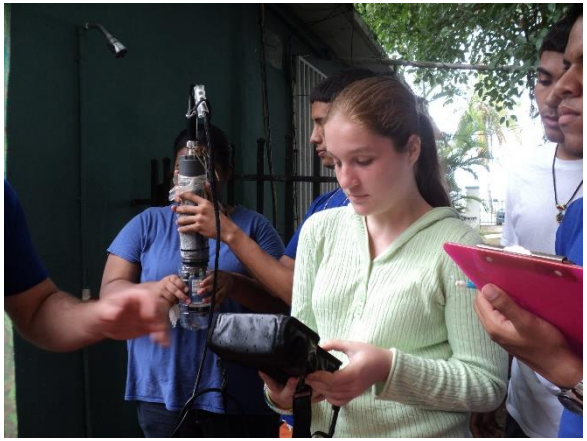
Very low rankings in PR Schools and national testing

Extremely high drop out rates

Using classroom citizen science as substitute teachers?

Manta

- A VCHT built hands-on educational program that uses nature to teach about ecosystems and conservation.
- Uses a STEM approach to involve participants in the study and improvement of their natural treasures



Manta & Manta Sabado

- Manta grew from summer programs into year round after school thanks to an EPA grant.
- It has won the Environmental Quality Award
- The director received the EPA Environmental Quality Award for an Outstanding Teacher of Environmental Education
- It is well established as a successful nontraditional education program and has evolved into integration, leadership and family programs

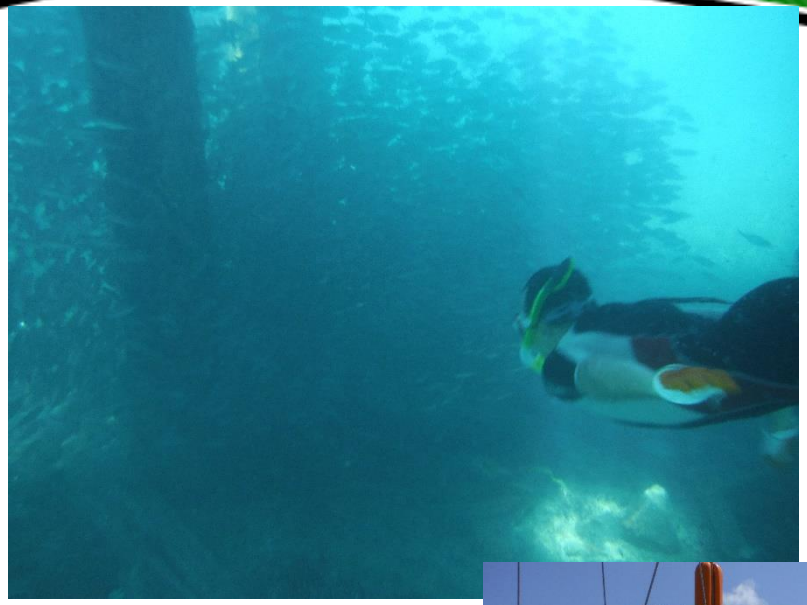
How it works

It has to appeal to the senses

Participants must
Feel what they are working with

Take them out

Make it fun



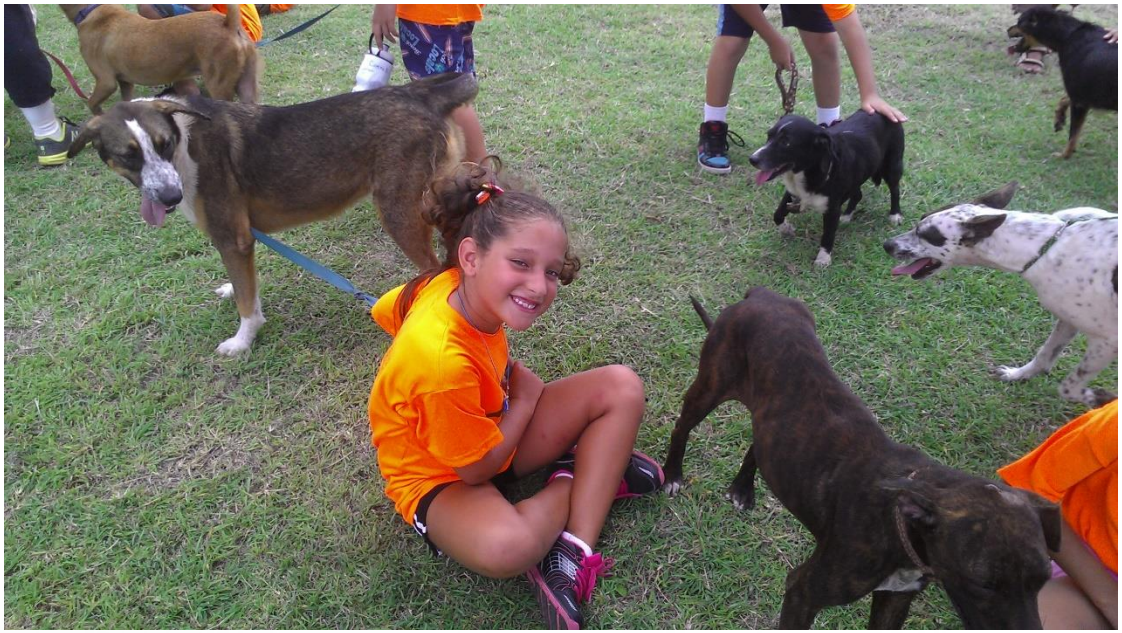
Education must evolve to compete with the modern world

Fun is a great incentive for participation

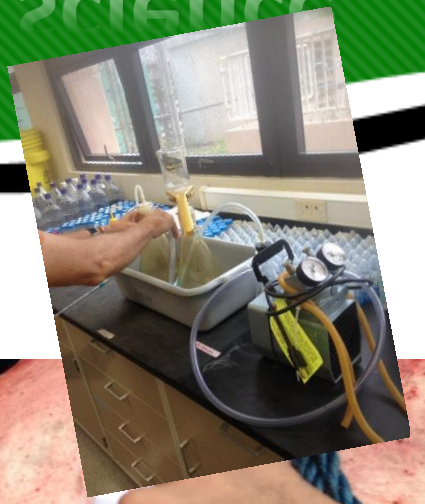
Bring the magic back to science

Manta Community service

Participation in actual change gives power



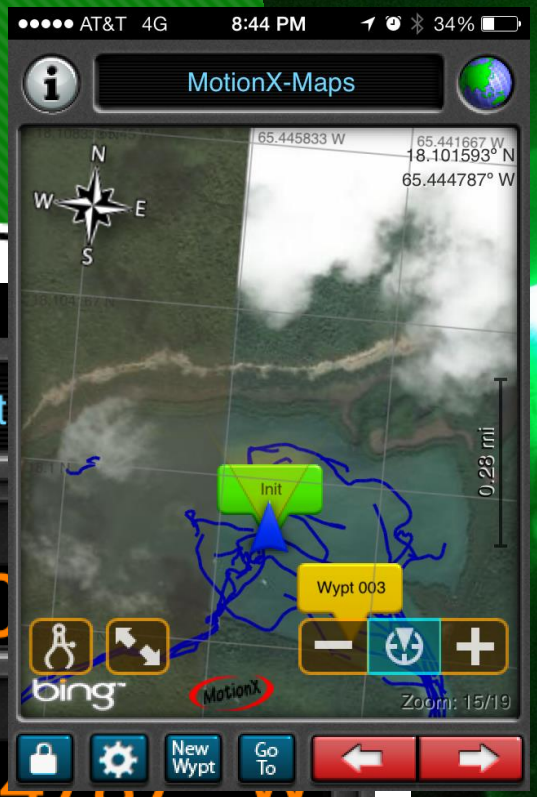
Manta organically grown citizen science

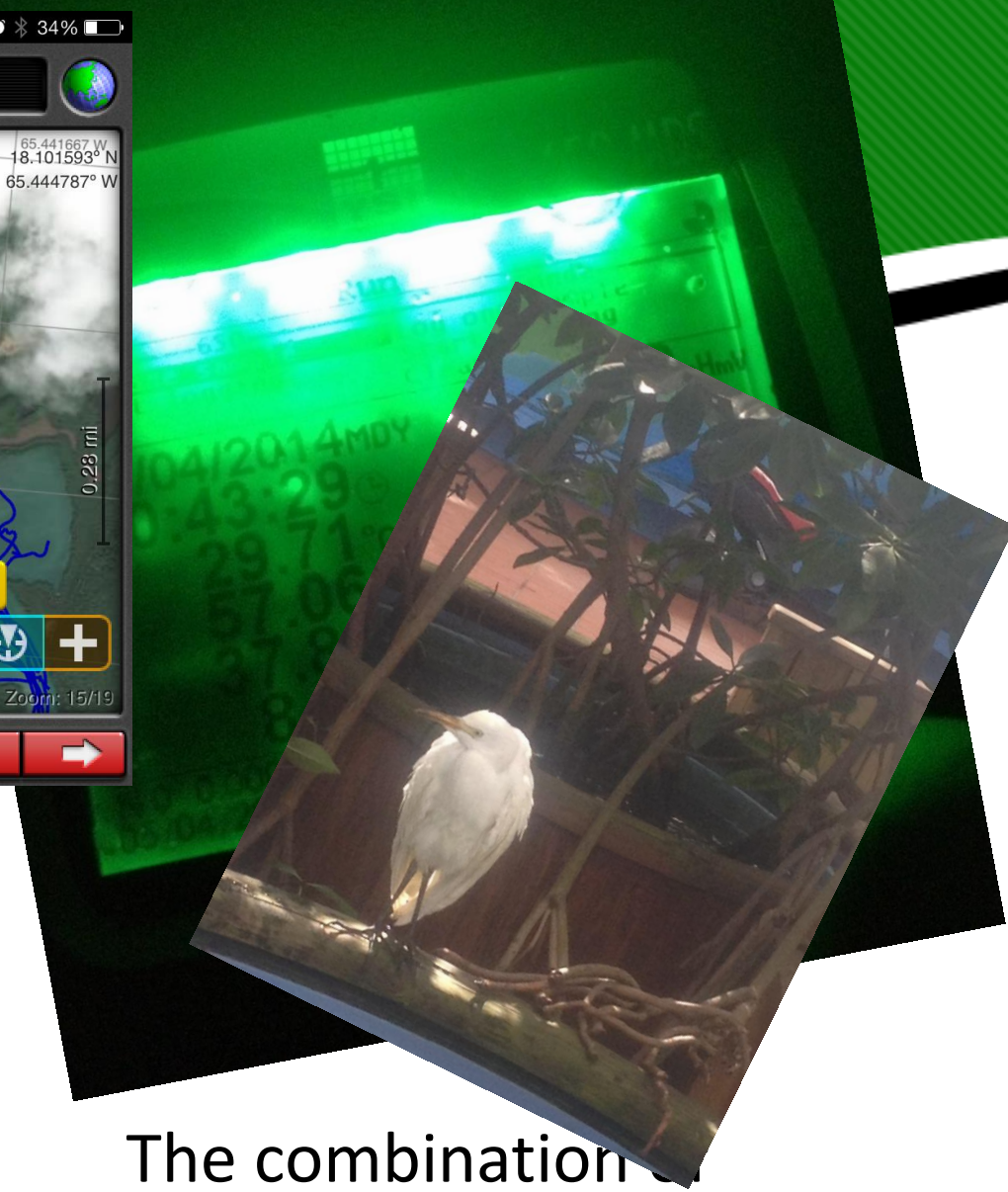


- Worked with visiting scientist on:
- Bioluminescent bay research
- Lionfish
- Bird counts
- Water quality
- Sea turtles
- Astronomy
- Sharks
- Seahorses

reefs
Plants
Cultural resource identification

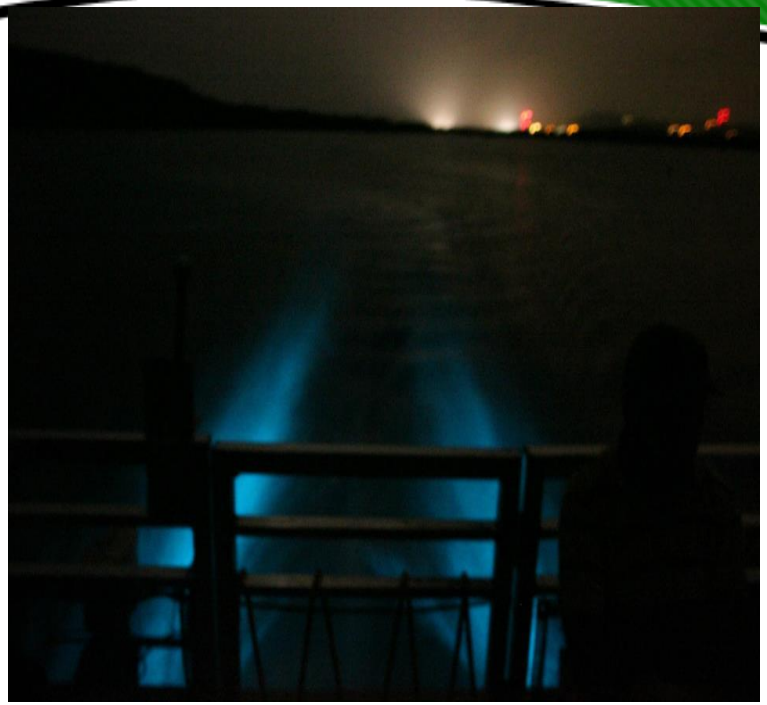
Techno



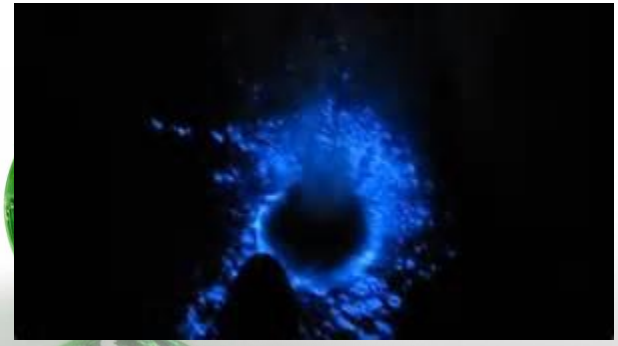


The combination of technology and nature
Is a huge answer to not becoming a dinosaur or a

A world's treasure, The BAY



- Puerto Mosquito is one of the last remaining pristine bioluminescent bays in the world
- A source of national pride
- A driver for the Vieques economy
- An invaluable research resource
- A perfect classroom
- A nursery
- A safe port
- A place of Magic



Research

We use everyone
Staff
Scientists
Students
Teachers
Community leaders
Families
Tourists
Agencies
In researching research in the bay
we found out
Three things

1. There is a lot of gaps in the studies
2. There is a lot we don't know
3. We can't wait for the science

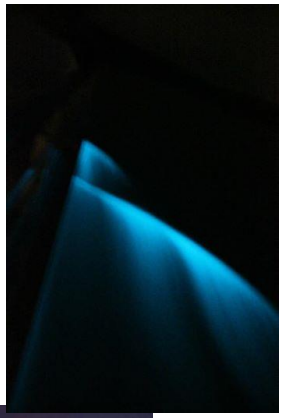
Pros and Cons for scientists

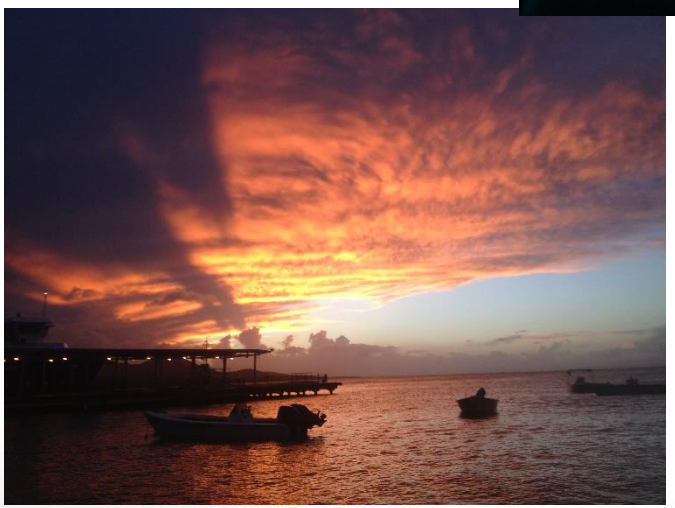
Vieques challenges

- Hard to get to
- Lack of availability of supplies and services
- Difficult situations
- Costly

Pros and Cons for scientists

- Incredible and unique areas of studies
- Real need
- and





EPA

- Water Quality- Established a sediment and erosion control project that included a water quality monitoring in Puerto Mosquito
- Guide Training- Sponsored a training class for bioluminescent bay operators. The DNER has continued their own.
- Student Education- Reached thousands of students
- Septic System Survey-
- Escuela Barbosa- brownfield study
- Sustainability Task Force
- Local representative collaboration- Daniel Rodriguez

The bay goes dark

- On January 15th, 2014 we received reports that Puerto Mosquito is not glowing
- We informed USGS, DNR, and the University of Puerto Rico
- We collected water samples/ in some preliminary counts we found 200 P. bahamense per liter.

We tried to study

Possible factors	Test or analysis required	Recommendation or determination
Nutrient levels low because lack of rain	Nutrient studies, rain events, analysis of dry period, comparison to prior years or events	
Apogee of the moon	Analysis of actual effect of tide or biorithym indicator	
Tides	Analysis of available tide information, confirm tide levels to bay water level, comparison to prior years	
Wind Direction and speed	Analysis of available wind information and comparison to prior years	
Natural cycle	Gather data regarding cyclical patterns similar to this event	
Combining effect	Develop formula to include a combination of elements mentioned above to include as a possibility of a combination of factors or cumulative effect	

And more

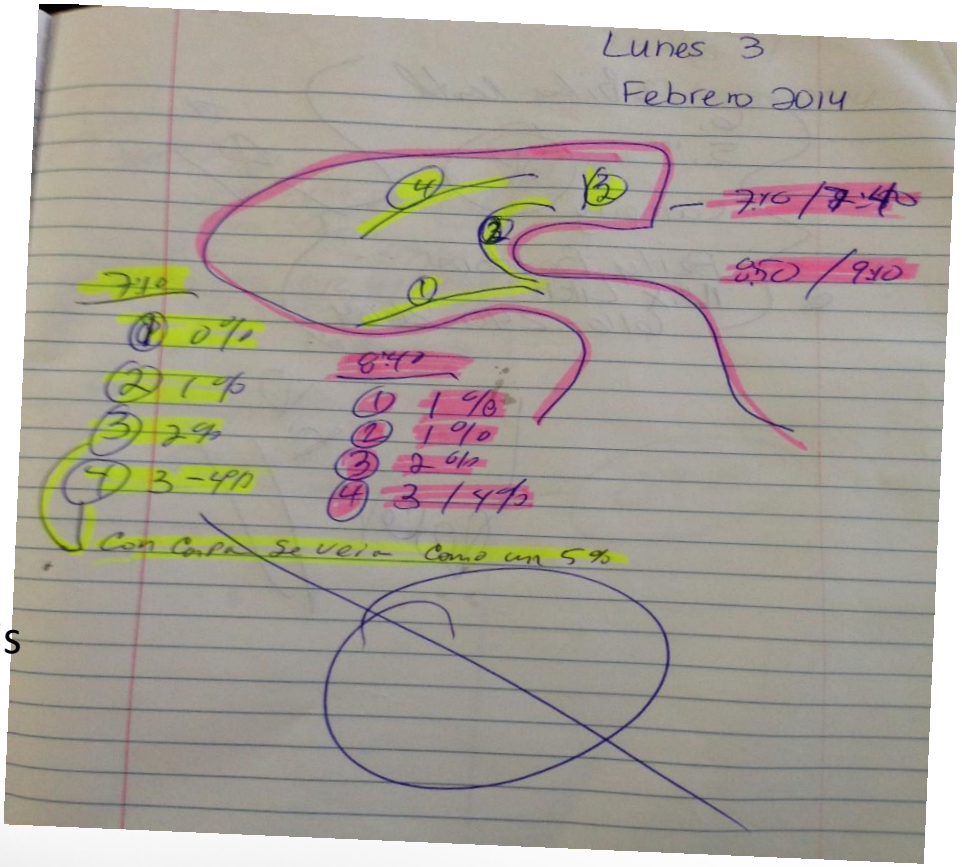
New sources around the bay Farms, housing, roadwork	**Analysis of substances being used in the area, changes within the hydrology basin, addition of new species or farming practices that could reach the bay.**
Changes to the bay Entrance depth, sediment	**Bathymetry and comparison studies to prior bathymetries cone in the bay especially entrance. Sediment samples for comparison to applicable parameters that have reference data from prior studies in the bay. Analysis for cyst of P. bahamense**
Impact from users Boats, kayaks, vehicles, trash, chemicals, sediment, turbidity,	Gather information available on effect of vessels on phytoplankton, Gather data related to current use of the bay by operators, fishers, visitors and other users. Chemical analysis of the water based on possible contaminants
Climate change	Data regarding waterlevels and atmospheric conditions that show a changing trend
Dumping of substance	Toxicology and chemical analysis of the water, gather information on alleged dumping source and location
Light pollution	Recommendation of analysis of increase of light pollution as visually imparing bioluminescence, dinoflagellate counts
Military based contaminants	Analysis based on claim military contaminants are present in the bay

Use what's there

USGS equipment that reads water quality parameters including pH, dissolved oxygen, salinity, temperature, and turbidity every 15 minutes had information available

Our advisors and the agencies responded

The DNER commissioned studies that were conducted by the University of Puerto Rico Humacao and Mayaguez campuses in conjunction of the VCHT.
EQB and USGS also conducted studies
The operators helped providing visual analysis



VCHT and agencies response required

- We conducted meetings and forums and think-tanks
- Months of consultations with scientific advisors
- Months of research and analysis
- We saw the controversies amongst the community and other stakeholders

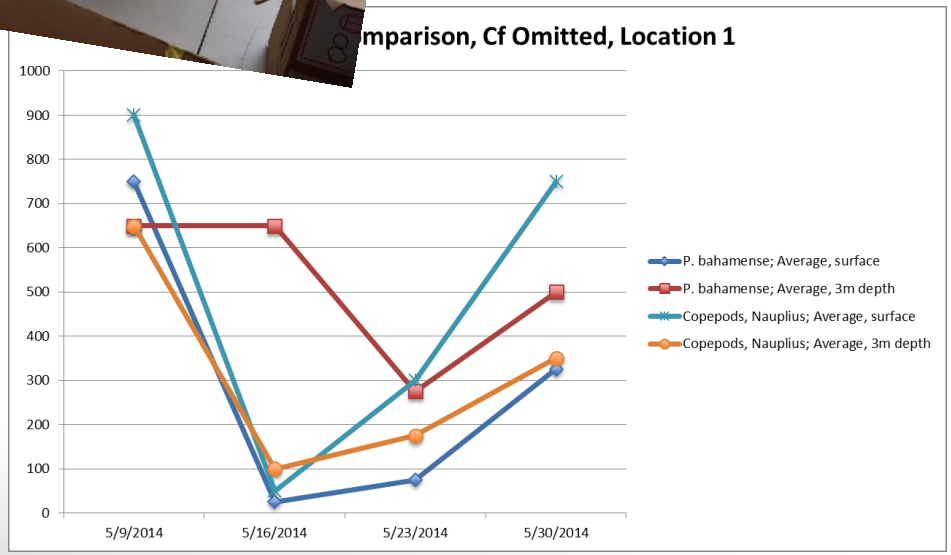
What we found

The decrease of bioluminescent dinoflagellates lasted from late January 2014 to early June 2014

Theories regarding tides and lack of nutrients were presented by the USGS and the UPR Mayaguez

We lacked a lot of necessary data

We need desperately constant monitoring and community participation beyond students
People get angry when they don't know/mistrust

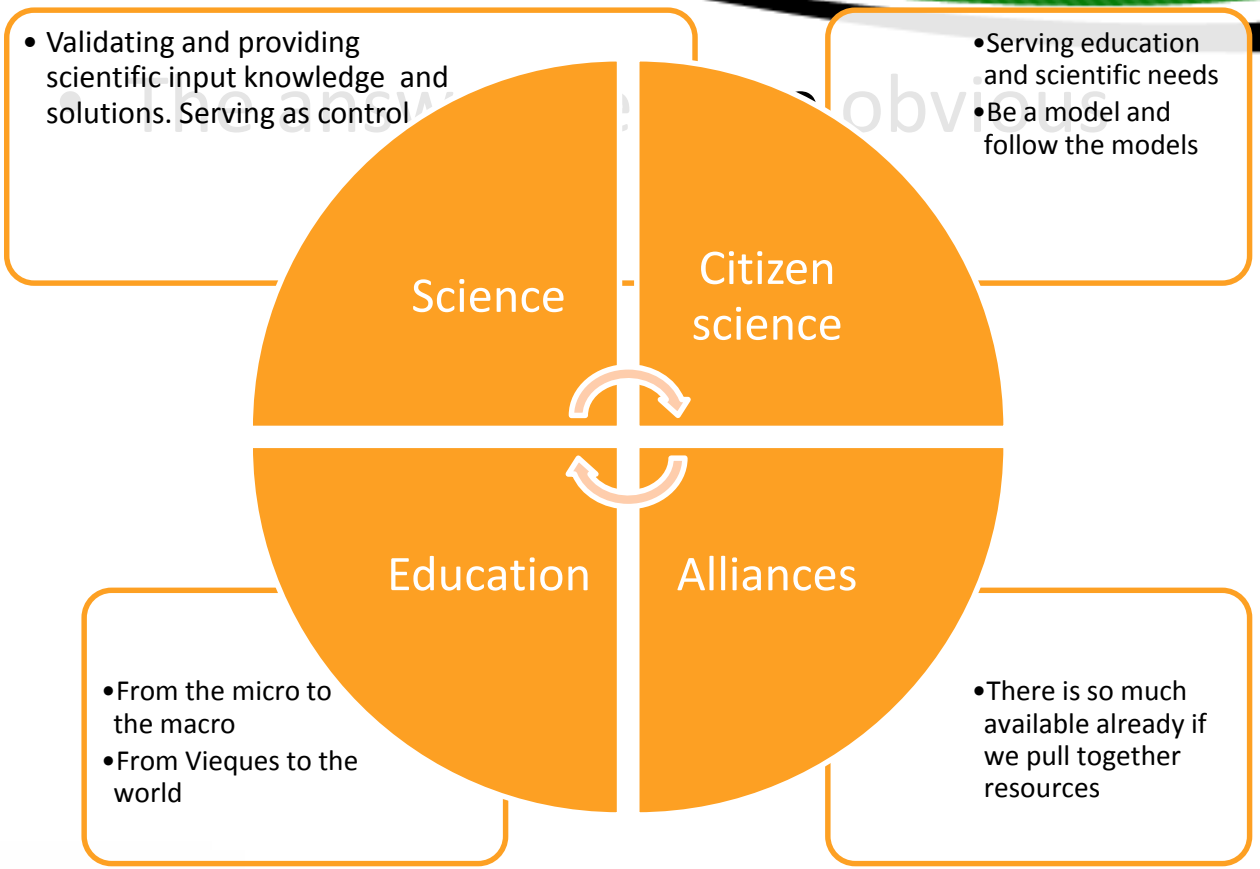


STEM and STEAM fit Citizen science well

		5/9/2014	5/16/2014	5/23/2014	5/30/2014
Surface	Pyrodinium bahamense, replicate 1	800	50	50	100
	Pyrodinium bahamense, replicate 2	700	0	100	550
	P. bahamense; Average, surface	750	25	75	325
Depth	Pyrodinium bahamense, replicate 1	650	100	400	500
	Pyrodinium bahamense, replicate 2	650	120		
	P. bahamense; Average, 3m depth	650	65		
Surface	Ceratium furca, replicate 1	550	5		
	Ceratium furca, replicate 2	400	15		
	C. furca; Average, surface	475	10		
Depth	Ceratium furca, replicate 1	650	5		
	Ceratium furca, replicate 2	350	10		
	C. furca; Average, 3m depth	500	7		
Surface	Copepods and Nauplius, replicate 1	1100	5		
	Copepods and Nauplius, replicate 2	700	5		
	Copepods, Nauplius; Average, surface	900	5		
Depth	Copepods and Nauplius, replicate 1	600	10		
	Copepods and Nauplius, replicate 2	700	10		
	Copepods, Nauplius; Average, 3m depth	650	10		

We had the opportunity to play with some really cool stuff

We got really tired, so



The little sonde that could run citizen science

A YSI 6520 multiparameter meter from the USGS working in the bay thanks the EPA, DNER, EQB and the VCHT it has:

- Taught thousands of students
- Taken hundreds of thousands of readings in the bay
- Only water quality meter used in the bay during Dark Period
- Served as support for Blue Flag designation
- Used in many cleanups
- It remembers

Where are we now

- Received funds from Senate of Puerto Rico for phytoplankton counts in Puerto Mosquito
- Working on the sediment and control project
- Expanding our Manta program to be structured with Citizen science
- Unity in the community by way working of science
- Installing a permanent water quality station in the middle of the bay with satellite links allowing our citizen science program to go surfing
- Developing technology and methodologies with the community with the help of agencies and scientific advisors

Escuela Barbosa Concept

- We received the use of an abandoned school to develop a science center, electronic library, research station.
- It is being conceptualized as a community serving, science integration project.
- We are looking for alliances to develop this project and our citizen science program which will begin this year is accepting your help. So thank you very much.